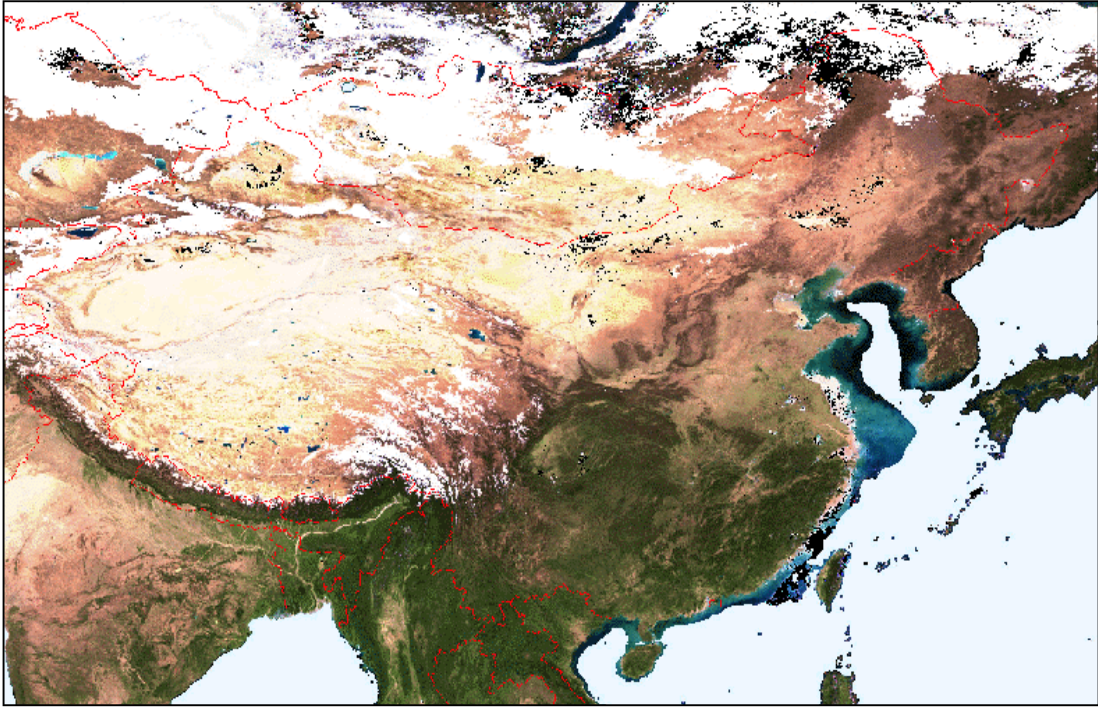蜀道观测

The framework for an Application of 3S Technology to Shu roads -
3S技术在古代栈道研究中应用的总体设计

DLB Jupp, CSIRO
Brian Lees, UNSW
Li Rui, CAS
Feng Suiping, Hanzhong Museum

贾大韦，澳洲科学院

李布朗，新南威尔士大学

李　锐，中科院水保所

冯岁平，汉中博物馆

Australian Government

Australia-China Council

❖ The ACC Project

❖ "Places" in Literature and Maps

❖ Historical Places & Tracks

❖ Traffic Routes and Relic Sites

❖ The Pilot Project – applying "3S"

❖ Conclusions

❖ 澳中项目

❖ 文献里和地图上的"地方"

❖ 有历史影响的地方与道路

❖ 交通路线和遗址

❖ 试验项目 – **"3S"**应用

❖ 结论

Australian Government

Australia-China Council

Australia-China Council Project -澳中理事会项目　蜀道观测

- ❖ The Australia-China Council is supporting this project with Hanzhong Museum and CAS Yangling
- ❖ A major achievement is the International Symposium in Hanzhong on the Shu Roads and "3S", its applications to history and conservation of relics (this Symposium)
- ❖ Following the symposium we will undertake a pilot project on the Qin-Ba roads, their geography and their place in history

- ❖ 澳中理事会资助的项目，有澳大利亚科学家，汉中博物馆和中科院（杨凌）参与
- ❖ 一个主要任务是在汉中举办国际研讨会，主题是蜀道与3S技术在历史研究和遗迹保护方面的应用（这个研讨会）
- ❖ 会后就进行一个试验项目，研究内容是应用3S技术研究秦–巴道路及其地理、历史地位。

CSIRO, UNSW, 杨凌水保所，汉中博物馆

"Places" in
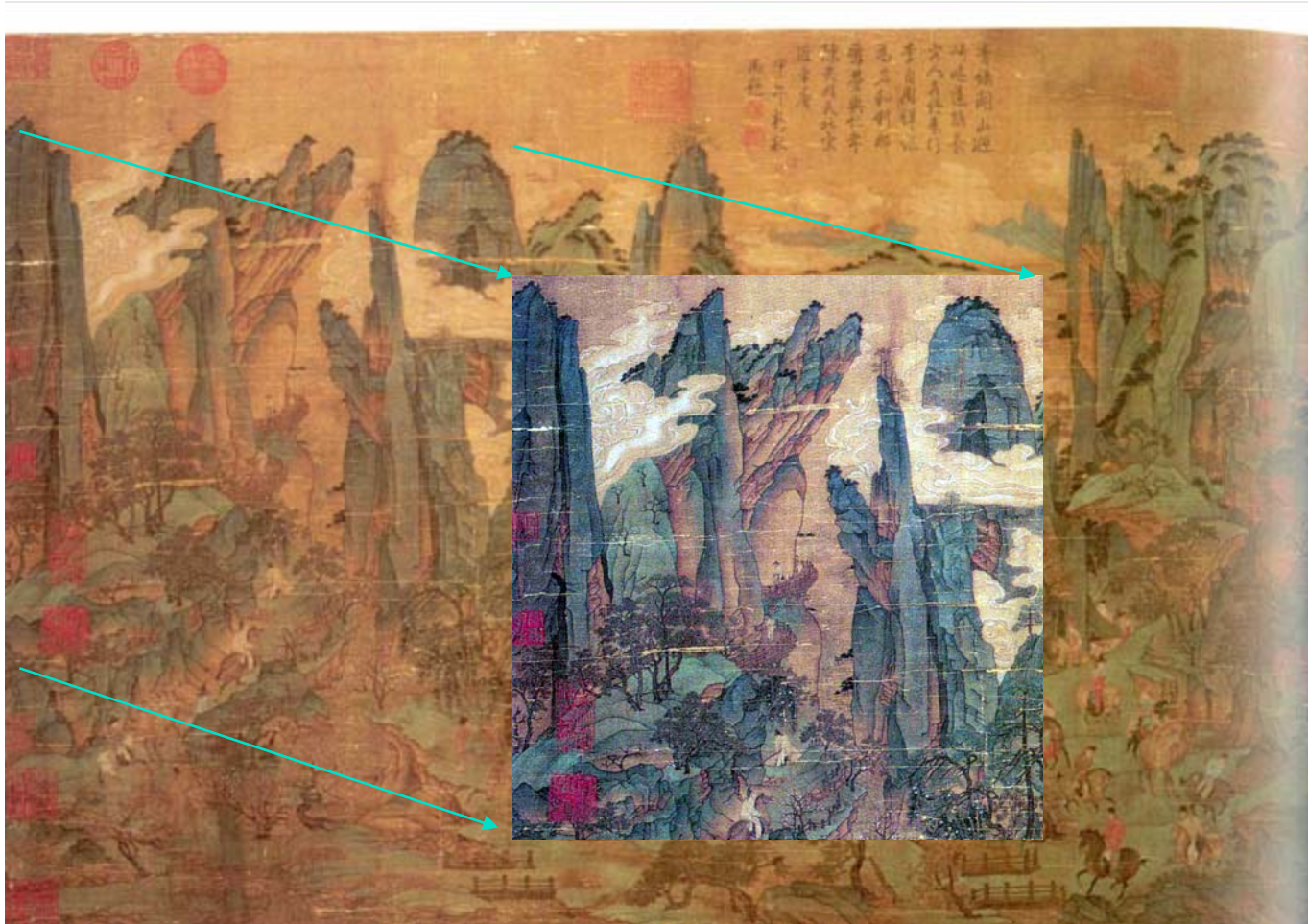Literature and
Maps

文献里和
地图上的"地方"

The rise of ancient and modern tracks
古代和现代道路的发展

- ❖ Originally ancient people found the Shu roads by trial and error.

- ❖ Terrain dominated the pathways which followed river valleys and crossed saddles between catchments

- ❖ Later, ancient engineers built roads and invented the Plank Roads

- ❖ In modern times, using explosives, earthmoving equipment and drilling the "silly man who would move the mountain" is not so silly

- ❖ 最初，古代的人不断摸索，找到了蜀道

- ❖ 深受地形的控制，这些道路顺着河谷，翻越流域之间的山脊

- ❖ 后来，古代的工程人员修筑道路，并发明了栈道

- ❖ 如今，使用炸药、掘土机、钻孔机等设备，"想把山移开的愚公"已不算多么愚蠢

Tang Ming Huang's Journey to Shu
唐明皇入蜀图

❖ China's history and literature include detailed records of past cities and towns and the great events that passed through them

❖ The traffic routes and the places along their way (towns) have often changed names, locations and importance in China's history

❖ The literature has a geography that creates a cross-linked set of names and relationships between places on traffic routes

❖ The result is topological and informative but not quite geographic

❖ 中国的历史和文献详细地记录了从前的城市、集镇，以及该地所发生的大事

❖ 在历史上，交通道路以及沿途城镇的名称、位置和重要程度常常变化

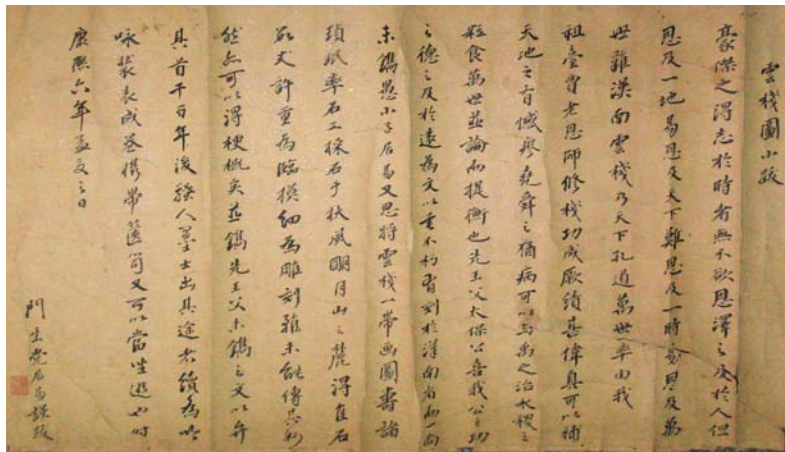❖ 文献中有关地理描述给出了一系列相互关联的地点及其相对关系

❖ 其结果带有地域性质有用的信息，但还不是完全意义上的地理

Australian Government

Australia-China Council

The map contains information
Of locations and events at places
Along the way

The details show the tracks
Linking the places along the
way and their place in terrain

这幅图带有道路沿途的地名和事
件的信息

从细部可看到将沿途各地方连接
起来的道路以及它们的空间位置

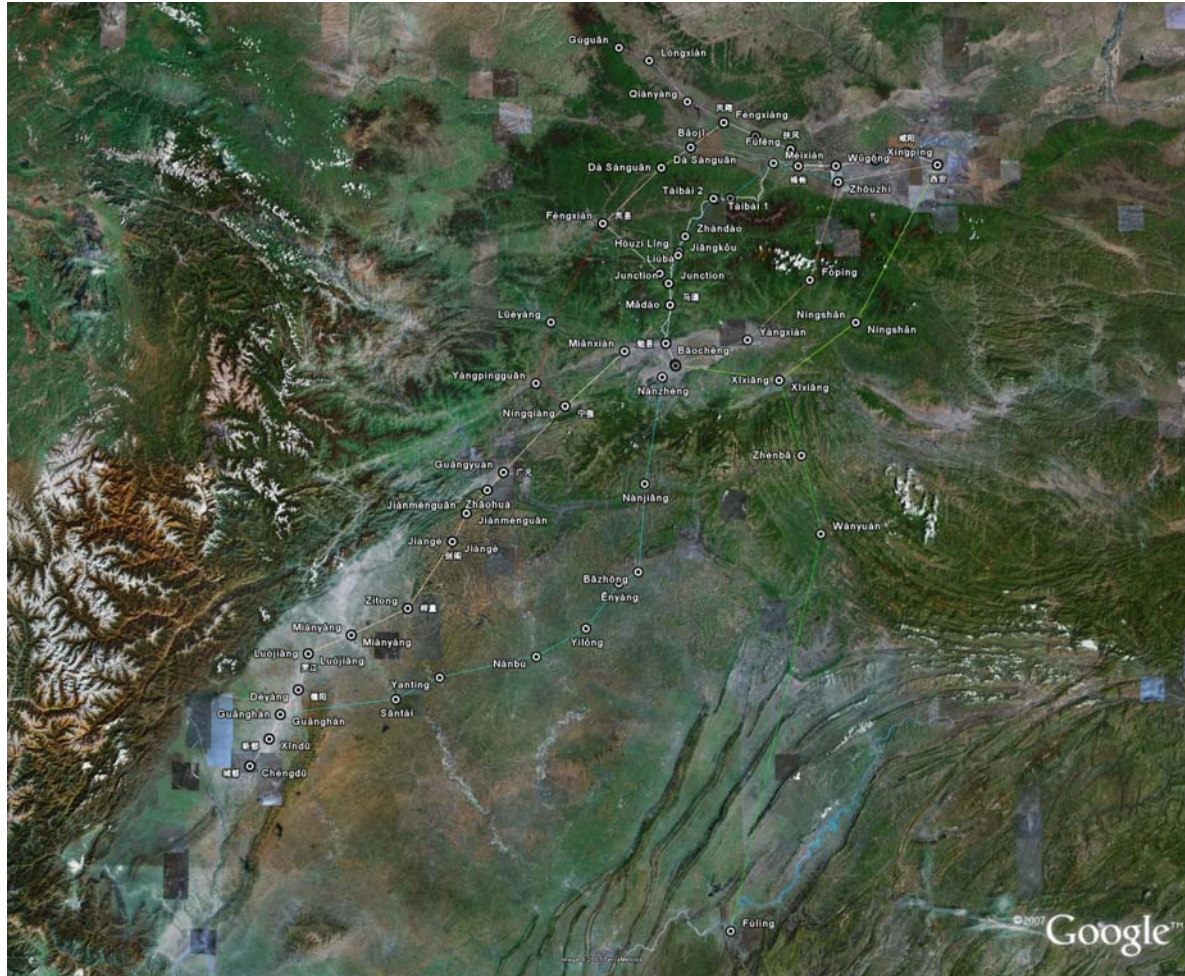# Historical Places and Modern Maps

有历史影响的地方与现代地图

Places from People and Books

Locations From Modern towns

地方：来自
书本和大众

位置：来自
现代城镇

- Places can be mapped by geographic location of modern places

- Links between places provide the route order of places on the Shu Roads

- At the broad scale the result is valuable but at the detailed scale the road travelled is missing

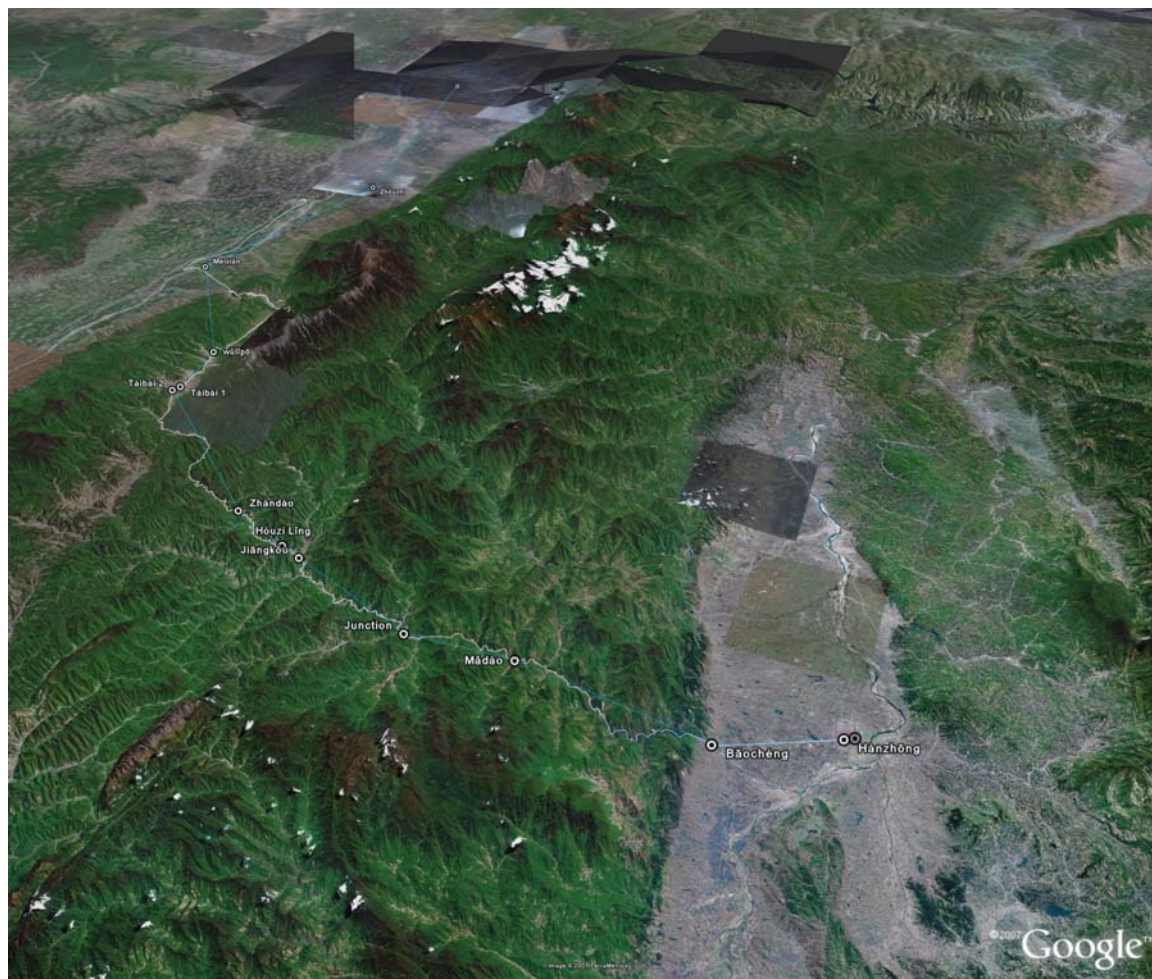- Shu Roads may also be initially defined by GPS survey along modern roads OR by using terrain information

- 地方：可以按照现代地方的地理位置来制图

- 蜀道上各地方之间的链接提供了各地方的位置次序

- 这个结果在大范围（小比例尺）时有价值，但在分辨细节地物（大比例尺）时，有的道路就难以分辨。

- 蜀道也可以先沿现代道路用GPS定位，或采用地形信息确定

GPS
Track from
Yangling
To
Hanzhong
Via
Baoye Road

经褒斜道
从杨凌到
汉中的
GPS航迹

Pictures kindly provided by Frank Moore

照片由Frank Moore先生提供

(Below) Newer Road
Baoji to Chengdu 1940's
(下)宝城公路
宝鸡通往汉中，20世纪40年代

(Above) Old Road
Baoji to Hanzhong 1930's
(上)老路

宝鸡通往汉中，20世纪30年代

CSIRO, UNSW, 杨凌水保所，汉中博物馆

Traffic Routes and Relic Sites

交通路线与遗址

- ❖ At the fine scale – the scale of relics and Plank Road construction – these methods are not sufficient

- ❖ Relics need to be preserved, protected and also mapped

- ❖ The relic scale is the human scale and the one where the greatest impact exists

- ❖ We aim to map relics and relic sites in a way that is also consistent with the previous mapping

- ❖ 对于大比例尺 - 遗址和栈道比例尺 - 这些方法就不能满足需要

- ❖ 遗址需要保存、保护，也需要定位、制图

- ❖ 遗址比例尺就是"能分辨人的比例尺"，也是影响最大的一个

- ❖ 遗址遗迹的制图方法要跟前面的连贯一致

Australian Government

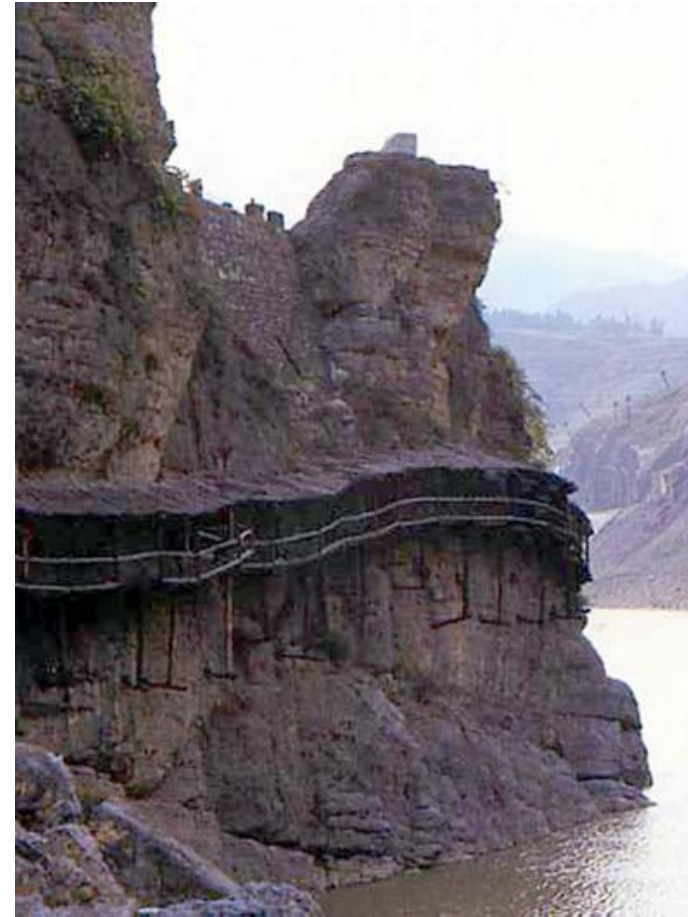Australia-China Council

CSIRO, UNSW, 杨凌水保所，汉中博物馆

Mingyue Gorge, Sichuan
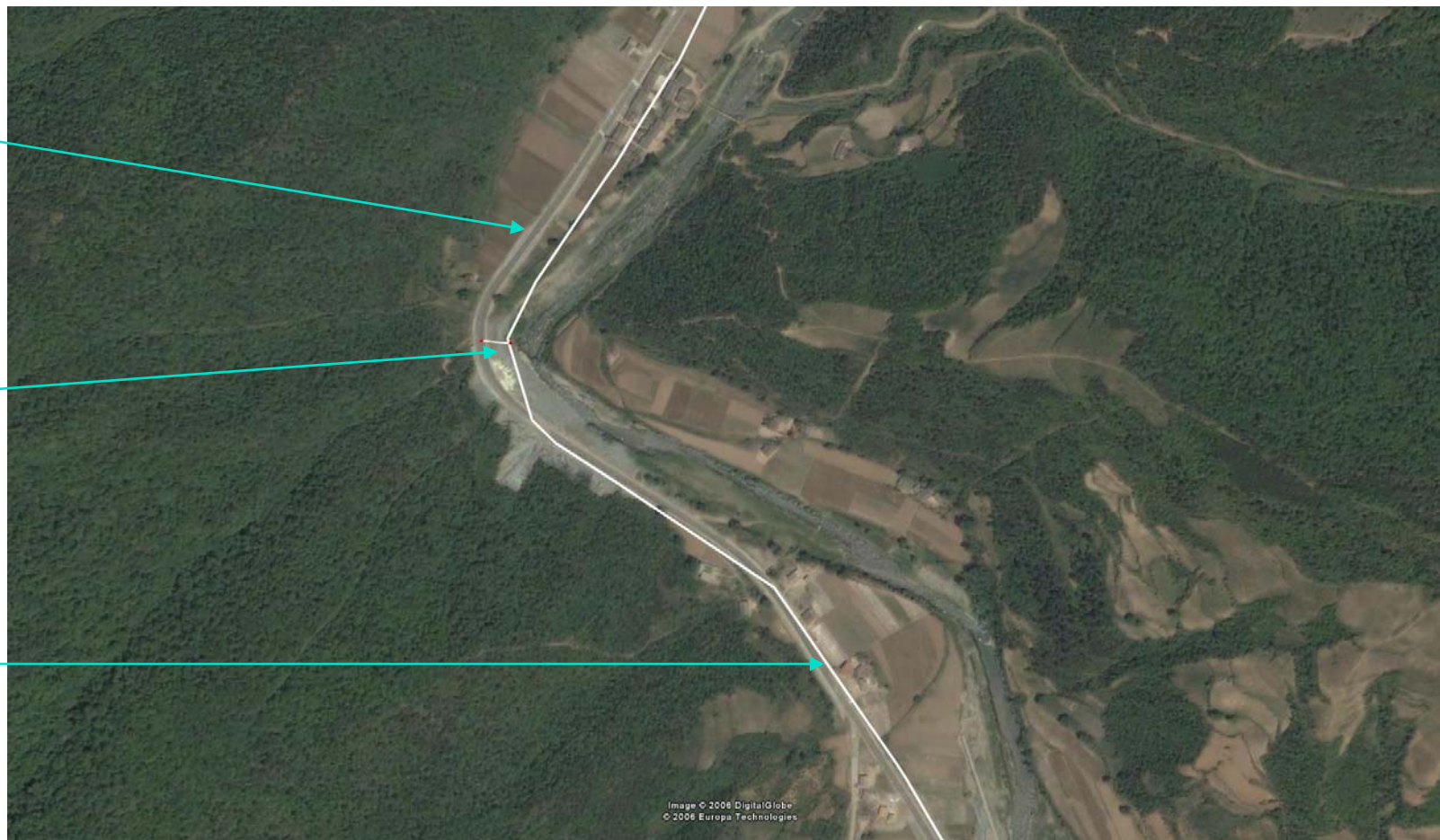
Baoxie "Trestle" Road

石积式栈道

四川明月峡栈道

General Scale and Relic Scale may not match –
普通地物比例尺和遗址比例尺可能不吻合

Road

道路

30 m

三十米

GPS
Track

GPS航迹

High Resolution Image (1m) 高精度图像(1m)

The Pilot Project
Applying "3S"

"3S"应用的试点项目

❖ We will undertake a Pilot Project

❖ Two outputs
  - ◆ An initial map of the Shu Roads based on places with demonstration of time, place and events
  - ◆ A relic based GISc system using "3S" in a location of value to Hanzhong Museum

❖ The project will use remote sensing data, terrain information and GPS mapping

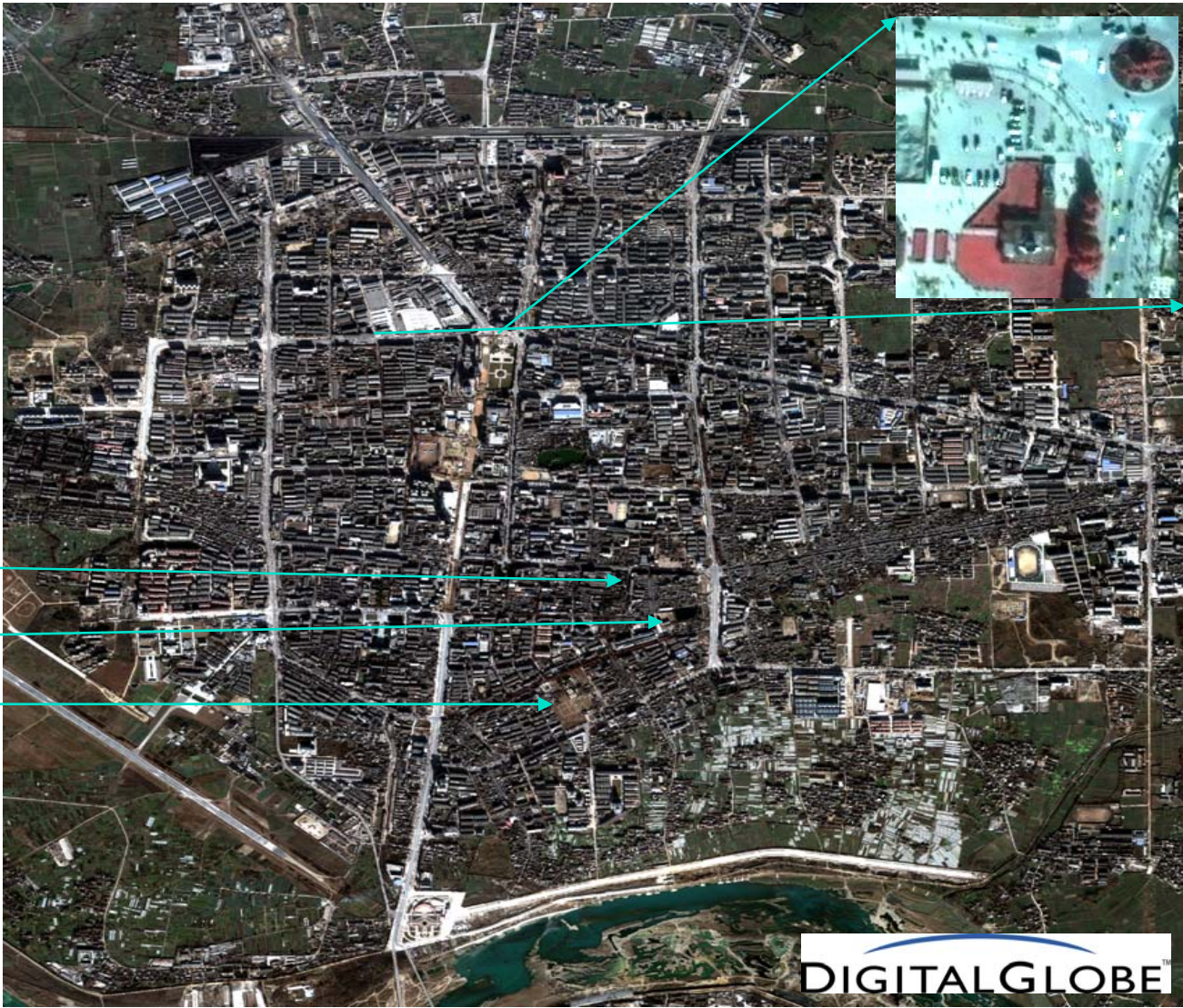❖ The data will be brought together and made into a framework of consistent information system

❖ 我们将开展一个试验项目

❖ 两个预期成果
  - ◆ 一个可以显示时间、地点和历史事件，基于"地方"的蜀道图，
  - ◆ 选择一个典型区段，应用3S技术建立一个基于遗址的地理信息系统框架。

❖ 该项目要采用遥感数据，地形信息和GPS定位

❖ 综合各种数据，形成一个综合的信息系统框架

Reaching
To the
"Person"
Scale

达到
"分辨
人"的
比例尺

"Three
Han"
Relics

"三汉"
遗址

❖ "3S" is Chinese shorthand for "Remote Sensing", "GIS" and "GPS"

❖ Remote Sensing involves information taken from satellites, aircraft and balloons

❖ GIS is the management of maps and other georeferenced information

❖ GPS is the technology of positioning using satellite geodesy

❖ These are the tools with which people undertake Geographic information Science (GISc)

❖ 3S是中文对遥感、地理信息系统和全球定位系统的简称

❖ 遥感是从卫星、飞机和气球上得到信息

❖ 地理信息系统是管理地图与其它带有地理坐标要素信息的系统

❖ 全球定位系统利用卫星大地测量技术进行定位

❖ 这些是研究地理信息科学的工具

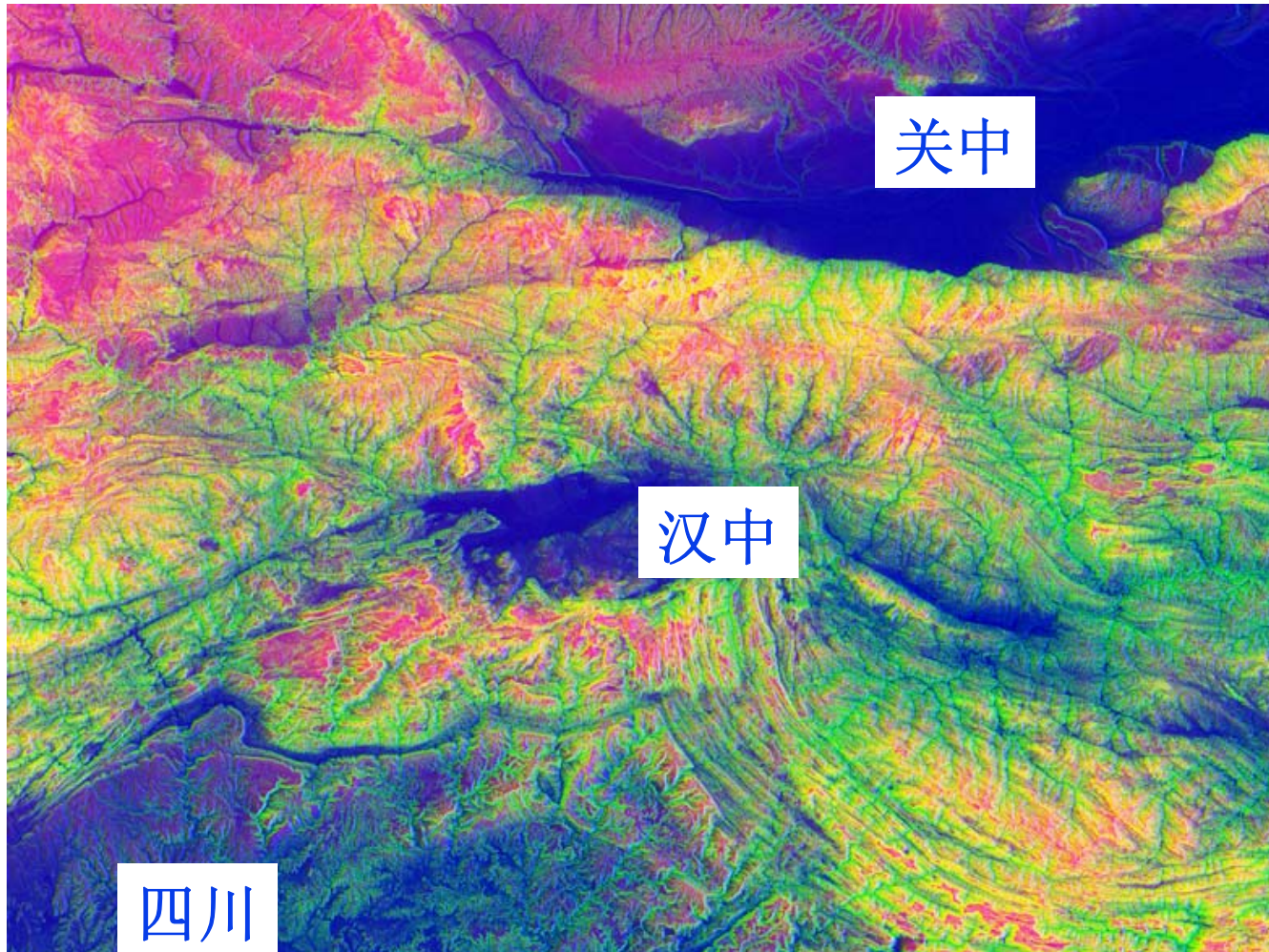# SRTM Elevation Image – SRTM 影像 58-06
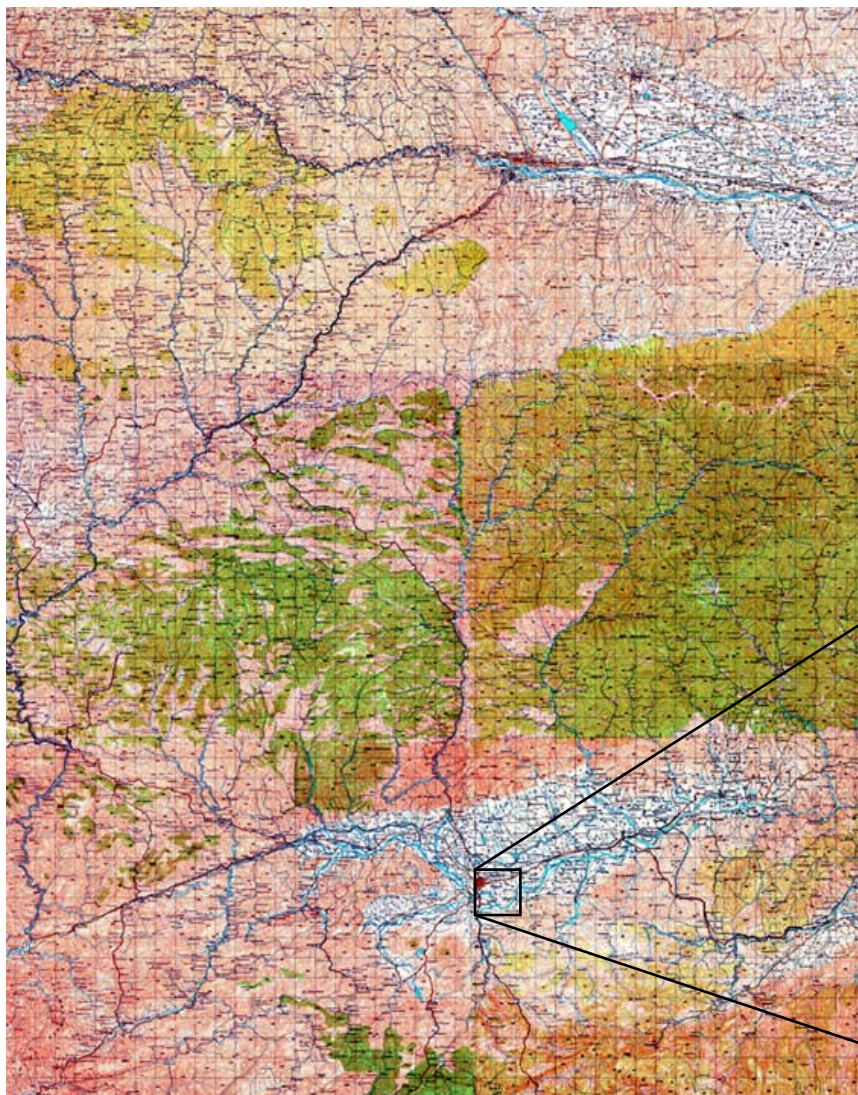
Shuttle Radar Terrain Mission

Global 90m DEM

关中

汉中

四川

SRTM

全球 90m DEM

Australian Government | Australia-China Council

Scanned Map Sheets - 扫描的地图

陕西省
地图

Shaanxi
Province
Maps

3S illustrated in one picture – **3S** 集于一图

蜀道观测
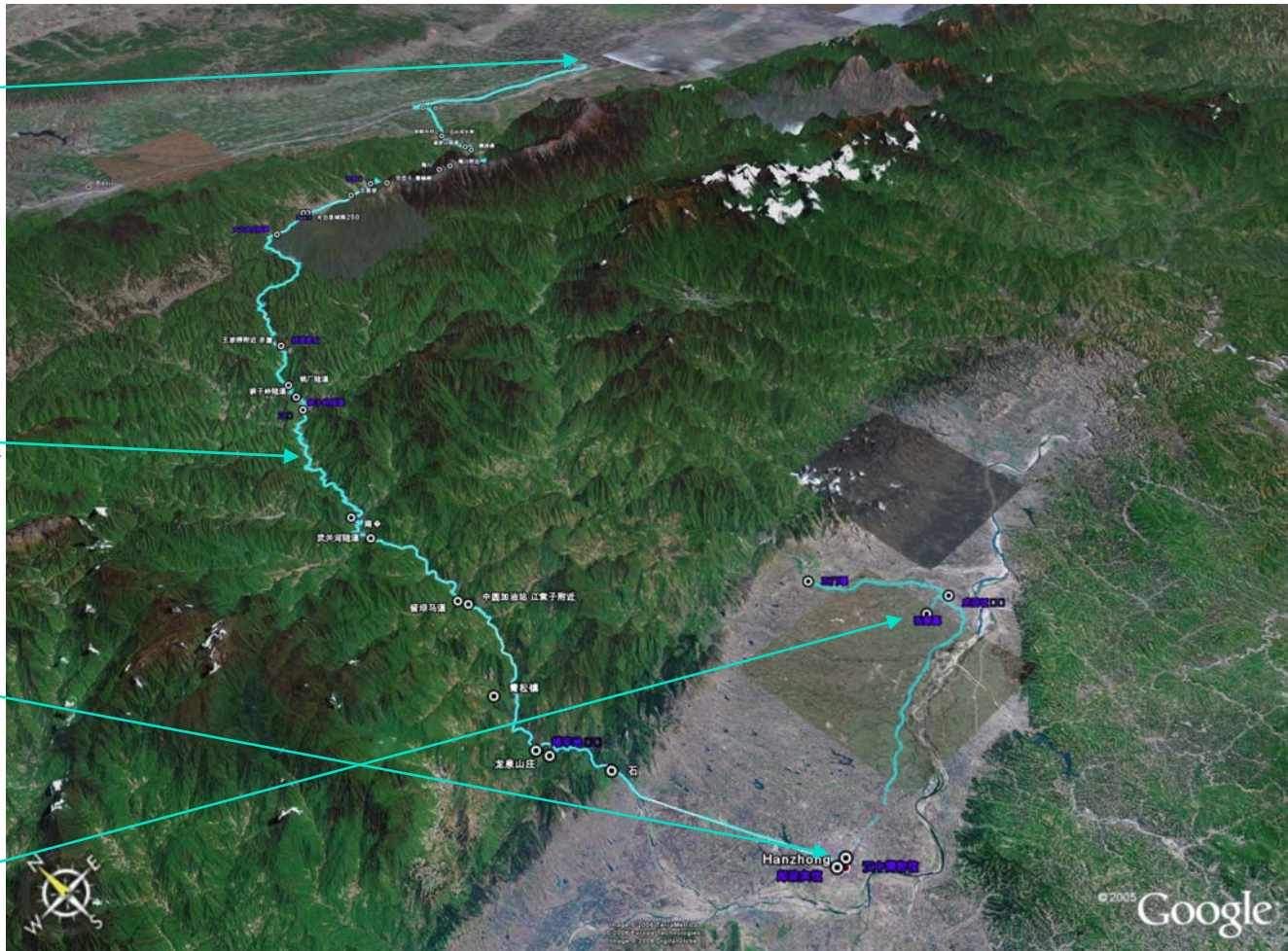
NWISWC — 杨凌水保所

GPS Track — **GPS**航迹

Hanzhong Museum — 汉中博物馆

Zhang Qian Tomb — 张骞墓

Conclusions

结论

- The technology of 3S and the science of GISc can provide valuable tools for Shu Road research

- The Pilot project will focus on a section of the Baoye Road over a range of historical periods to define the framework for a future information system

- The success of the project depends on the involvement of people with deep historical knowledge, cultural appreciation and interests in Geography

- 地理信息技术与科学可以为蜀道研究提供一个有价值的研究方法

- 试验项目将重点研究褒斜道典型地段在不同历史阶段环境地理的变迁，综合多种信息与研究成果，为综合信息系统建立框架

- 课题的成功有赖于具有丰富历史知识，文化素养和地理兴趣的人员的参与

❖ Important outcomes of this Symposium and the Pilot project will be to:

- ◆ Promote cultural awareness in Australia and other countries of Hanzhong's place in Shu Road history

- ◆ Increase future interchange between these groups

- ◆ Promote use and benefits of 3S technology to Shu Road research and to the preservation of its relics in the Hanzhong region

❖ 本次研讨会与试验项目的预期成果：

（1）增进国际对汉中蜀道历史文化遗产研究成果的认识与了解

（2）促进汉中考古研究与世界同行的交流与合作

（3）促进3S技术在蜀道研究和汉中地区历史文物保护中的应用

Reconstructed
Plank Road

Stone Gate
Reservoir

重建的栈道

石门水库

- ❖ NASA for MODIS & SRTM images
- ❖ Digital Globe for Google Earth and Hanzhong images
- ❖ Frank Moore for old photographs of the road to Hanzhong
- ❖ Ruth Mostern UC Merced for "Journey to Shu"
- ❖ Li Lingtao for his great contribution to translations of English to Chinese

- ❖ NASA：MODIS和SRTM图像
- ❖ Digital Globe：Google Earth和汉中图像
- ❖ Frank Moore：通往汉中的道路的老照片
- ❖ Ruth Mostern UC Merced ：蜀道路线
- ❖ 李领涛真好英文翻译成中文的帮助